

A NEW VARIETY OF *FESTUCA ROEMERI* (POACEAE) FROM THE CALIFORNIA
FLORISTIC PROVINCE OF NORTH AMERICA

Barbara L. Wilson

Carex Working Group
2710 Emerald Street
Eugene, Oregon 97403, U.S.A.
bwilson@peak.org

ABSTRACT

The grass *Festuca roemerii* is a community dominant in grasslands and savannas from southwest British Columbia through central California. Inland plants in southern Oregon and California differ from more northern *F. roemerii* in isozyme profiles, leaf pubescence, some inflorescence measurements, and perhaps physiology. These populations are here described as ***F. roemerii* var. *klamathensis***.

RESUMEN

Festuca roemerii es una gramínea dominante en la comunidad de pastizales y savanas del suroeste de Columbia Británica hasta el centro de California. Plantas distribuidas desde el interior del suroeste de Oregón hasta el noroeste de California difieren de *F. roemerii* por la pubescencia foliar, los perfiles de isoenzimas, algunas medidas de la inflorescencia y quizás en su fisiología. Estas poblaciones son descritas en el presente trabajo como ***F. roemerii* var. *klamathensis***.

A dominant bunchgrass of savannas in the Klamath Region of Oregon and California has been identified variously as *Festuca idahoensis* Elmer, *Festuca idahoensis* × *F. occidentalis* Hook. hybrids, *F. idahoensis* var. *oregana* (Hack.) C.L. Hitchc., *F. ovina* L., and *F. rubra* L. In despair, some botanists simply report *Festuca* sp. The grass is *F. roemerii* (Pavlick) E.B. Alexeev (Alexeev 1985; Pavlick 1983; Wilson 1999), but differs slightly from typical, more northern *F. roemerii*. It is described here as a variety of *F. roemerii*.

Festuca roemerii* var. *klamathensis B.L. Wilson, var. nov. (**Figs. 1–2**). TYPE: U.S.A. OREGON. Jackson Co.: Rogue River National Forest, Baldy Peak Trail, T40S R3W S22, 2 Jul 1996, B.L. Wilson 8199 (HOLOTYPE: OSC; ISOTYPES: DAV, MO, NY, RSA, UC, UTC)

A *Festuca roemerii* var. *roemerii* foliorum tricomatibus adaxialibus longioribus et numerosioribus differt.

Cespitose, the old plants sometimes dying in the center, leaving a ring of living shoots; leaf sheaths open (sheath margins overlapping) to the base; leaves glaucous, occasionally green; leaf blades erect, somewhat stiff, conduplicate, 5–30(–50) cm long, 0.55–1.2(–1.5) mm wide, the abaxial (outer) surface glabrous or pubescent, the adaxial (inner) surface with numerous hairs 0.06–0.3 mm long (the longer hairs often about as long as the leaf is thick), adaxial ribs 5–9; veins 5–7(–9). Abaxial sclerenchyma bands >2× as wide as thick, usually forming large bands at margins and midrib, often with smaller bands opposite veins, usually lacking adaxial sclerenchyma; flag leaf 1.5–7 cm long; culm nodes becoming exposed 1; flowering shoots (20–)30–95 cm long, panicle 7–15(–20) cm long. Inflorescence branches at lowest node 1–2, appressed (usually) or spreading after anthesis; spikelets 2–6 on longest branches, 7–16 mm long. Florets 3–5; glumes unequal, the lower 3.2–5.1(–5.7) mm, the upper 4.4–6(–7.2) mm long; lemma (6–)6.2–8.5 mm long, glabrous, with lemma awn (1–)1.5–4.6 mm long, shorter than the lemma body; anthers 3–4.2 mm long; ovary apex glabrous. Tetraploid.

Distribution.—inland sites from southern Douglas County in southwest Oregon to northwest California, east of the coastal mountains (Fig. 3).

Habitat.—community dominant in mesic to dry pine or oak savanna, grasslands, and edges of grassy balds, on a variety of substrates including serpentine.

Festuca roemerii was originally described as *F. idahoensis* var. *roemerii* Pavlick, based on populations found in upland sites in the moist, maritime climate of southwest British Columbia and northwest Washington



FIG. 1. *Festuca roemeri* var. *klamathensis*, habit. Left: Wilson 8199, from *Pinus ponderosa* savannah on non-serpentine soils, Jackson County, Oregon. Right: White & Lillico 210, from serpentine grassland in Josephine County, Oregon.

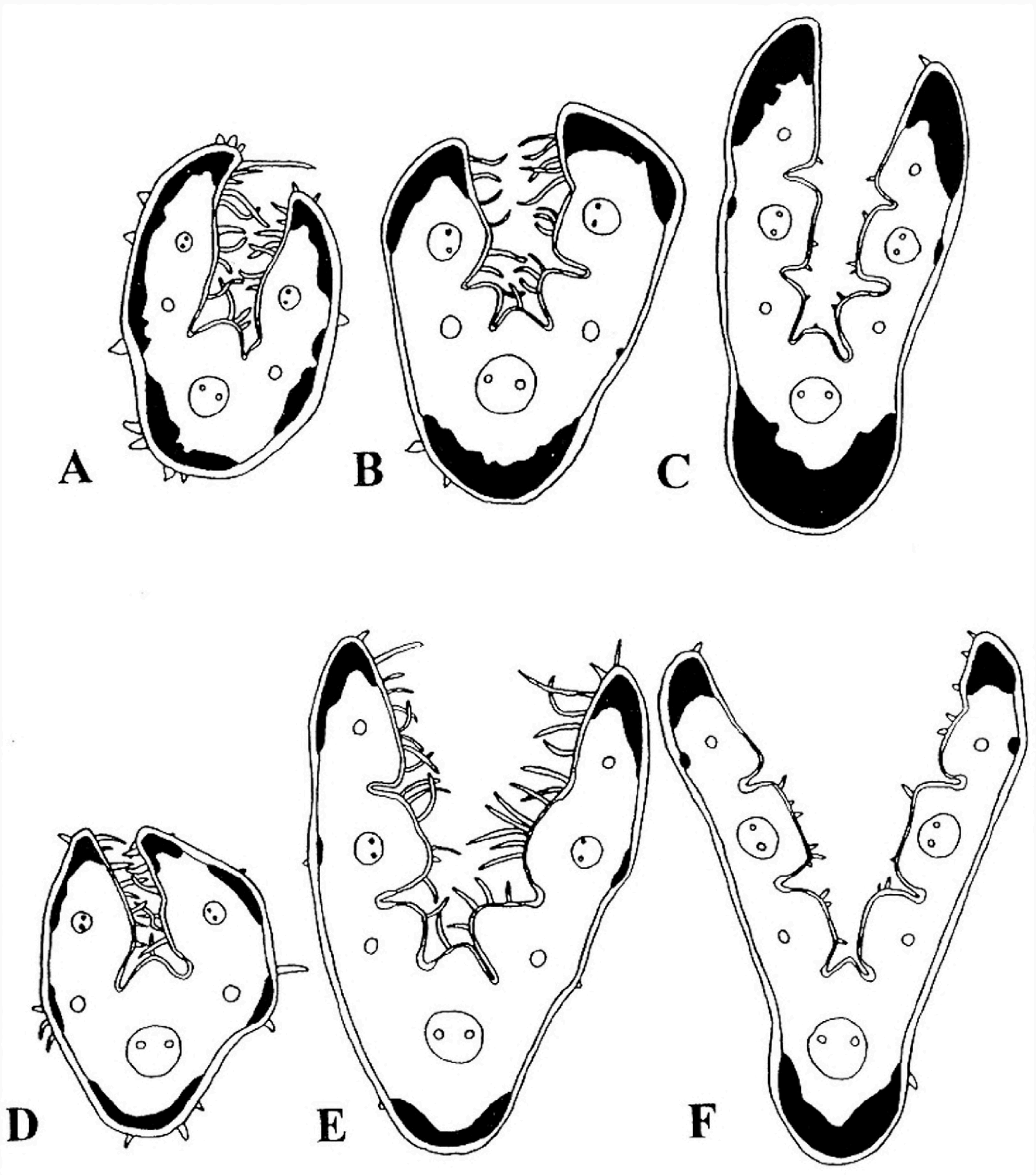


FIG. 2. Leaf cross-sections of field-collected plants (top row) and plants from a common greenhouse environment (bottom row). A and D: *Festuca idahoensis*. B and E: *F. roemerii* var. *klamathensis*. C and F: *Festuca roemerii* var. *roemerii*.

(Pavlick 1983). It was soon recognized at the species level (Alexeev 1985). *Festuca idahoensis* sensu stricto is widespread east of the Cascade Range and Sierra Nevada through the western Great Plains. The narrow conduplicate leaves with dense hairs on the inner surface (where the stomata are located) are adaptive for the dry to xeric continental climate in which it grows. *Festuca roemerii* differs from *F. idahoensis* sensu stricto in its ovate to obovate-pyriform leaves that have few hairs on the inner surface. *Festuca roemerii* is more widely distributed than was initially realized, growing at least as far south as Santa Cruz County, California.

At inland sites in southwestern Oregon and northwestern California, *F. roemerii* grows in dry, continental

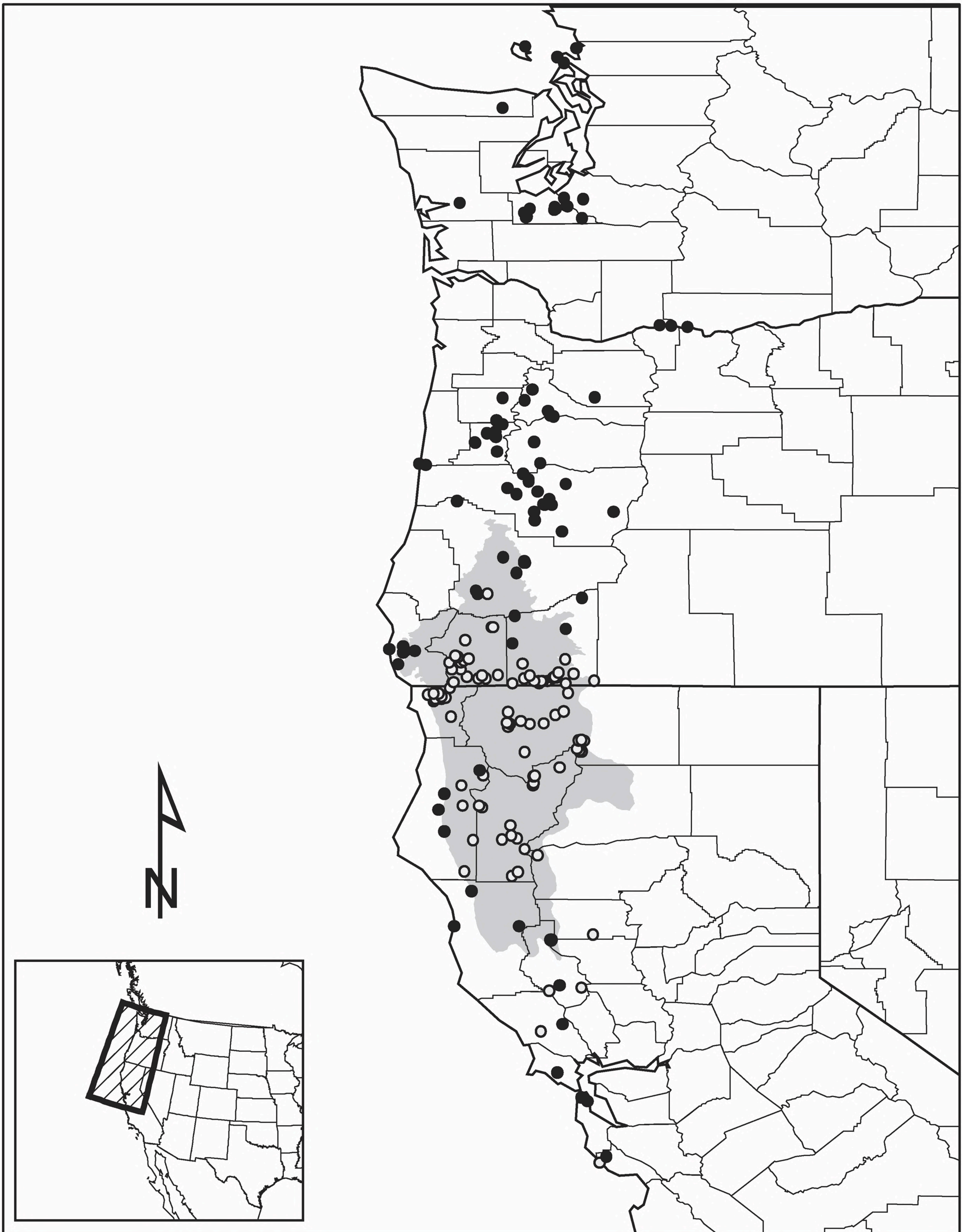


FIG. 3. Distribution of *Festuca roemerii* var. *klamathensis* (open circles) and *F. roemerii* var. *roemerii* (shaded circles) in the U.S.A. Shaded area is the Klamath ecoregion.

environments similar to those inhabited by *F. idahoensis*. These inland populations differ from *F. roemerii* var. *roemerii* in having long hairs on the inner surface, like *F. idahoensis* (Fig. 2). Even in a common greenhouse environment, *F. roemerii* var. *klamathensis* had more and longer hairs than *F. roemerii* var. *roemerii* (Table 1). The difference in leaf hairs can be detected in the field by bending the opened leaf over a finger and viewing the adaxial surface with a hand lens: leaves of *F. roemerii* var. *roemerii* appear glabrous whereas those of *F. roemerii* var. *klamathensis* appear distinctly pubescent. In *Festuca*, the extent of abaxial pubescence is greater at high temperatures (Aiken et al. 1994), but adaxial hair characters may be more stable than other leaf anatomical traits, and the adaxial hair traits are species specific (Aiken et al. 1994; Dubé & Morisset 1996; Ramesar-Fortner et al. 1995; Wilson 1999).

A combination of other traits distinguishes *F. roemerii* var. *klamathensis* from *F. roemerii* var. *roemerii* and from *F. idahoensis*. *Festuca roemerii* var. *klamathensis* often has leaves with a shape more typical of *F. roemerii* var. *roemerii*, although plants growing on serpentine substrates have leaves nearly as narrow as those of *F. idahoensis* (but with better defined ribs and grooves). Glumes and lemmas average slightly longer in *F. roemerii* var. *klamathensis* than in *F. roemerii* var. *roemerii* (Table 2). In *F. roemerii* var. *klamathensis*, isozyme band patterns as revealed on gels stained for malate dehydrogenase (following the methods of Wendel & Weeden 1989) match those of *F. idahoensis*, not *F. roemerii* var. *roemerii* (Wilson 1999).

Festuca roemerii var. *klamathensis* is phenotypically plastic. Plants of fertile soils have lush, dense bunches of 30 cm long, moderately glaucous leaves, and lemmas up to 8 mm long. They do not resemble the intensely glaucous, depauperate individuals of serpentine barrens, which may have leaves up to 7 mm long, gnarled bases, dead centers, and lemmas up to 6.5 mm long. When brought into the greenhouse the depauperate plants produce broader leaves (Fig. 2; Wilson 1999). Plants of intermediate stature exist in the wild, but extensive populations usually have only large or only depauperate individuals, leading biologists to treat these variations as different taxa. A similar range of variation is observed in *F. roemerii* var. *roemerii*, but in that variety depauperate plants are usually found on rock outcrops within populations of more lush plants.

From Lake County, California, southwards, plants of *F. roemerii* are intermediate and cannot always be classified into either variety. *Festuca roemerii* var. *klamathensis* is named as a variety, rather than a subspecies, because of these intermediates. On the north and west edges of its range, the transition zone is narrower.

The name *Festuca idahoensis* var. *oregana* (Hack.) C.L. Hitchcock has been applied to dwarfed fescues of western Washington and Oregon, including those referred to here as *F. roemerii* var. *klamathensis* (Hitchcock et al. 1969), but its type specimen (Cusick 753, Oregon, 1884; US!), is *F. idahoensis* (Pavlick 1983), which can also be dwarfed when growing extremely stressful microhabitats. The type of *F. ovina* var. *columbiana* Beal (1886; US!) is *Lake s.n.* June 1882 (labeled as collected near Pullman, Washington, but apparently really collected near the head of Tukanon River, Blue Mountains, Washington, according to an annotation by Piper). It appears to be *F. idahoensis* as well, and was collected well outside the known range of *F. roemerii*.

Conservation concerns

Application of the names *Festuca idahoensis* and *F. ovina* to populations of *F. roemerii* var. *klamathensis* has led land managers to mistakenly plant commercial cultivars of *F. idahoensis* and “Sheep Fescue” as native species in habitat restoration projects within the range of *F. roemerii* var. *klamathensis*. *Festuca idahoensis* plantings within the range of *F. roemerii* var. *roemerii* usually die because *F. idahoensis* is adapted to be winter dormant in a drier climate with less pressure from fungal pathogens, but *F. idahoensis* may survive in the environment of *F. roemerii* var. *klamathensis*. Hybridization between the two tetraploid taxa might well occur and could result in the loss of genetic traits typical of *F. roemerii* var. *klamathensis*, including its adaptive phenotypic plasticity. Planting Sheep Fescue as a native grass is erroneous because *F. ovina* and the other taxa sold under this name, such as *F. trachyphylla* (Hack.) Krajina and *F. valesiaca* Gaudin, are not native to North America. A second concern is that demand for *F. roemerii* var. *roemerii* seed has grown faster than the supply of seed. Unlike *F. roemerii* var. *roemerii* (Wilson 1997), *Festuca roemerii* var. *klamathensis* is common and rarely grows with other fine-leaved fescue species. This simplifies collection of uncontaminated seed and establishment of pure cultivated seed sources. Nomenclatural clarification may reduce pressure to use

TABLE 1. Traits of *F. roemerii* leaf anatomy. **N** = number of individuals measured. **Max** = maximum value. **Min** = minimum value. **s** = standard deviation. Probability (**p**) is the probability that the measurements for *F. roemerii* var. *roemerii* and *F. roemerii* var. *klamathensis* are the same.

	<i>F. roemerii</i> var. <i>roemerii</i>					<i>F. roemerii</i> var. <i>klamathensis</i>					Probability p <
	N	Mean	s	Max.	Min.	N	Mean	s	Max.	Min.	
Plants from the field											
Number of vascular bundles	15	6.61	0.62	7.33	5.00	11	5.45	0.60	6.33	5.00	9.77 × 10 ⁻⁵
Number of fibers (sclerenchyma strands)	15	5.27	1.27	8.00	3.00	11	4.10	0.82	5.67	3.00	0.008843
Adaxial hair length (mm)	15	0.031	0.026	0.117	0.014	11	0.094	0.044	0.216	0.061	0.000629
Adaxial hairs/side	15	4.57	1.81	8.75	2.00	11	10.39	1.97	14.50	8.12	1.53 × 10 ⁻⁷
Adaxial grooves	15	5.34	0.69	6.00	4.00	11	4.20	0.36	5.00	4.00	1.84 × 10 ⁻⁵
Plants from greenhouse											
Number of vascular bundles	16	6.59	0.73	7.5	5.00	11	5.98	0.98	7.50	5.00	0.9308
Number of fibers sclerenchyma strands)	16	5.40	1.78	8.0	3.00	11	4.04	0.91	5.25	3.00	0.01591
Adaxial hair length (mm)	16	0.013	0.005	0.020	0.006	11	0.077	0.078	0.304	0.017	0.02144
Adaxial hairs/side	16	1.83	1.41	6.00	0.50	11	8.93	4.27	14.00	0.00	0.00018
Adaxial grooves	16	5.34	0.73	6.50	4.00	11	4.43	0.79	6.00	3.70	0.006039

F. roemerii var. *klamathensis* seed at inappropriate locations. Third, *F. roemerii* var. *roemerii* is uncommon to rare in much of its range, with most Oregon populations varying from 13 to approximately a thousand individuals. The fate of this taxon is not tracked when it is treated as taxonomically identical to *F. roemerii* var. *klamathensis*.

Etymology.—The name *klamathensis* is appropriate for this fescue variety because the ancient, varied, and botanically complex Klamath Range (Whitaker 1960) is the center of its distribution. This region is named after the Klamath people who live there and once used fires to manage the *F. roemerii* var. *klamathensis* grasslands.

The following key distinguishes the native and the more common introduced fine-leaved fescues growing at low to moderate elevations in and near the range of *F. roemerii*.

KEY TO FINE-LEAF FESCUES OF PACIFIC COASTAL STATES AND PROVINCE

- 1a. Longer awns longer than the lemma bodies; ovary apices densely pubescent; plants growing in the shade _____ **F. occidentalis**
- 1b. Longer awns none or up to as long as the lemma bodies; ovary apices glabrous (rarely with <10 hairs); plants growing in the sun or in partial shade.
 - 2a. Plant rhizomatous _____ **F. rubra**, sensu lato
 - 2b. Plant caespitose.
 - 3a. Lemmas >(5.8–)6 mm long.
 - 4a. Leaves very narrow, smoothly rolling between the fingers, round to hexagonal in cross section; ribs on adaxial surface usually 3(–5); native range east of the Cascade Range and Sierra Nevada (in California wholly east of Interstate Highway 5) but occasionally planted to the west ____ **F. idahoensis**
 - 4b. Leaves wider, not rolling between the fingers or doing so with angles that can readily be felt, V-shaped or obovate to elliptic in cross section; ribs on adaxial surface 5 or more; native range west of the Cascade Range and Sierra Nevada (in northern California, near or west of Interstate Highway 5) _____ **F. roemerii**
 - 5a. Hairs on the adaxial surface of leaves short (<< thickness of leaf) and usually sparse (except in some south coastal and Columbia Gorge populations) _____ **F. roemerii** var. **roemerii**
 - 5b. Hairs on the adaxial surface of leaves long (½ to about = thickness of leaf) and dense _____ **F. roemerii** var. **klamathensis**
 - 3b. Lemmas <5.8, usually 4–5.5 mm long.
 - 6a. Leaf sheaths with margins fused to near the top (but readily splitting as the plant grows); leaf

TABLE 2. Selected measurements of *F. roemerii* inflorescences. **N** = number of individuals measured. **Max** = maximum value. **Min** = minimum value. **s** = standard deviation. Probability (**p**) is the probability that the measurements for *F. roemerii* var. *roemerii* and *F. roemerii* var. *klamathensis* are the same.

	<i>F. roemerii</i> var. <i>roemerii</i>				<i>F. roemerii</i> var. <i>klamathensis</i>					Probability p <	
	N	Mean	s	Max.	Min.	N	Mean	s	Max.		Min.
Panicle length (cm)	21	13.28	2.39	19.5	9.5	19	11.39	3.31	18.0	5.6	0.0485*
Lower glume length (mm)	21	3.42	0.66	4.9	2.0	19	3.89	0.69	5.7	3.2	0.0341*
Upper glume length (mm)	21	5.04	0.59	6.2	4.2	19	5.52	1.14	7.2	4.4	0.1135
Lemma length (mm)	21	6.95	0.42	7.9	6.5	19	7.47	0.72	8.5	6.3	0.0097*
Longest awn length (mm)	21	3.94	0.89	5.3	2.3	18	3.40	0.90	4.6	1.8	0.0692

sclerenchyma bundles < 2× as broad as thick (but sometimes fused into broader groups);
leaf

sheaths brown and shredding to reveal whitish veins. Native and introduced taxa ____ **F. rubra**, sensu lato

6b. Leaf sheaths with overlapping margins; leaf sclerenchyma bundles generally > 2× as broad
as thick; leaf sheaths paler, not shredding _____ introduced Sheep and Hard Fescues

7a. Leaves thinner (0.4–0.6 mm wide); leaf sheaths not conspicuously broader than blades;
leaves always with at least 5 ribs on adaxial surface; adaxial hairs many and long; leaf sclerenchyma

interrupted and sometimes consisting of three discrete bands _____ **F. valesiaca**

7b. Leaves often broader (0.5–1.2 mm wide); leaf sheaths in some cultivars conspicuously
broader than blades; leaves with 3 - many ribs on adaxial surface; adaxial hairs many and
short; leaf sclerenchyma various, sometimes forming a continuous band under the ab-
axial

epidermis _____ **F. trachyphylla**

APPENDIX

SPECIMENS OF *FESTUCA ROEMERI* VAR. *KLAMATHENSIS* EXAMINED

In Oregon, all legal descriptions (TRS) are based on the Willamette Meridian.

CALIFORNIA: Alameda Co.: Upper end of Corral Hollow, 18 Apr 1941, *Hoover 4847* (UC); W of Corral Hollow, on road to Livermore, 21 May 1939, *Stebbins 2710* (DAV). **Del Norte Co.:** Stoney Creek Bog, T17N R2E S16 (H meridian), 26 May 1978, *Alcasas 103* (HSC); T18N R1E S35 (H meridian), 20 Jun 1979, *Baker 868* (HSC); Old Gasquet Road, T17N R2E S13& S24 (H meridian), 25 Jun 1975, *Barker 1006* (HSC); near Gasquet, 22 May 1979, *Clinton & Overton 3084* (HSC); Gasquet, Jun 1902, *Davy s.n.* (UC); French Hill Road, T17N R2E S29 (H meridian), 14 Jun 1978, *Nelson 4152* (HSC); Smith River, Elk Camp Ridge, May 1937, *Parks & Tracy 5833* (HSC); state line N of Monumental, at head of Shelly Creek, 17 Jun 1936, *Parks & Tracy 11386* (UC); Stony Cr. Bog near Gasquet, T17N R2E S16 (MD meridian), 13 May 1973, *Smith 6749* (OSC); 1 mi SW of Patrick Creek, 19 Jun 1936, *Yates 5770* (DAV); 41°59'9"N, 123°58'16"W, 2 Jun 1980, *York 928* (HSC); near High Plateau Mt., 31 May 1980, *York s.n.* (HSC). **Humboldt Co.:** Trinity Summit, 31 Jul 1901, *Goddard 134* (UC); Brannan Mountain, 10 Jul 1930, *Tracy 8867* (OSC); Mail Ridge, 7 mi N of Harris, 15 Jun 1950, *Tracy 18803* (UC). **Lake:** Snow Mountain, 15 Jun 1979, *Heckard & Hickman 5040* (JEPS); Reiff, Knoxville Ridge, 11 Jun 1938, *Jepson 19012* (JEPS); between Cobb Mt. & Adams Spring on the Binkley Ranch, 4 Jul 1933, *Jussel 360* (UC). **Mendocino Co.:** Grouse Mountain, 25 Jul 1933, *Tracy 12890* (UC). **Santa Cruz Co.:** N end of Swanson Road, overlooking Greyhound Rock, 10 km NW of Davenport, 13 May 1983, *Buck & West 265* (JEPS). **Shasta Co.:** T28N R10W S6 (MD meridian), 22 Jun 1980, *Nelson & Nelson 5820* (HSC). **Siskiyou Co.:** Paradise Lake, Marble Mountains, trail to Kings Castle, 22 Jul 1949, *Alexander & Kellogg 58844* (UC); Rainbow Ridge above Sulloway Cr. about 1.5 mi W of Mt. Shasta City, 11 Jun 1936, *Babcock & Stebbins 1894* (UC); Rainbow Ridge above Sulloway Cr. about 1.5 mi W of Mt. Shasta City, 13 Jun 1936, *Babcock & Stebbins 2008* (UC); Big Flat Campground, 2 Jul 1959, *Bacigalupi 7232* (JEPS); headwaters of S Fork of Salmon River near N base of Caribou Mt., just S of low divide (Trinity Co. boundary) separating Coffie Creek drainage from that of Salmon River, 2 Jul 1959, *Bacigalupi 7234* (DAV); 40°24'20"N, 123°34'00"W, 20 Jun 1980, *Baker 2220* (HSC); 13 mi E of Hamburg, banks of Klamath River, 31 May 1942, *Beetle 3431* (DAV); Moffitt Creek, 13 Jun 1909, *Butler 833* (UC); Moffet Creek NW of Fort Jones, 6 Jun 1922, *Dunning s.n.* (JEPS); Big Flat, T37N R9W S18 (MD meridian), 3 Aug 1966, *Ferlatte 251* (HSC); Eastern Flank of Mt. Eddy, just below summit fell field, 13 Aug 1967, *Heckard 1709* (JEPS); Eastern Flank of Mt. Eddy, just below summit fell field, 13 Aug 1967, *Heckard 1711* (JEPS); toward the head of Wagon Creek, Mt. Eddy, 17 Jul 1920, *Heller 13680* (DAV); ½ mi SE of Kings Castle, Marble Mts., 6000 ft, 9 Jul 1939, *Hitchcock & Martin 5321* (UC); NE face of Marble Mountain, T43N R12W S15 (MD meridian), 4 Sep 1966, *Major s.n.* (DAV); Summit between Beach Creek & Toad Lake, 22 Jul 1959, *Murphy 591* (DAV); 0.2 mi E of Butcher Gulch on the Cecilville-Forks of Salmon

Road, 28 May 1972, *Smith & Sawyer 5384* (HSC); junction of French Creek and Sugar Creek Road, 1/2 mi W of Parrott Mill Road, 30 Jun 1972, *Smith & Sawyer 5641* (HSC); E of Cook and Green Pass, T18N R4W S8 (MD meridian), 3 Jul 1972, *Smith & Sawyer 5660* (HSC); T43N R12W S2 (MD meridian), 7 Jul 1976, *Stillman 161* (HSC); T43N R12W S15 (MD meridian), 7 Aug 1976, *Stillman s.n.* (HSC); Soap Creek Ridge between Yreka and Fort Jones, 3 Aug 1949, *Tofsud s.n.* (DAV); Mt. Eddy, T40N R5W S7& S 18 (MD meridian), 20 Aug 1976, *Whipple 1706* (HSC); Intersection Hwys 263 & 96, T47N R6W S18SW 1/4 of SW 1/4 (MD meridian), 30 May 1996, *Wilson 8094* (OSC); Highway 263 bridge over the Klamath River, at intersection with Highway 96, SE corner of bridge, T74N R6W S18SW 1/4 of SW 1/4 (MD meridian), 30 May 1996, *Wilson 8095* (OSC); Indian Scotty Campground, T44N R11W S26SW 1/4 of NE 1/4 (MD meridian), 1 Jun 1996, *Wilson 8112* (OSC); Quartz Valley Road, S of the Charity Mission, N of bridge over river (and N of Forest Service Road 43N21), T43N R10W S3SW 1/4 of NE 1/4 (MD meridian), 1 Jun 1996, *Wilson 8115* (OSC); Idlewild Campground on the Salmon River at the intersection of Forest Service roads 41N37 and 1CO1., T40N R10W S18SW 1/4 of SW 1/4 (MD meridian), 1 Jun 1996, *Wilson 8117* (OSC); Old Edgewood-Weed road, which parallels the I-5 on the E, 2.2 mi by road more or less W of N. Weed Blvd., and 2 mi more or less W of where a road crosses the railroad tracks and intersects with this one from the NE, T41N R5W S4 (MD meridian), 21 Jun 1996, *Wilson 8162* (OSC); Stewart Springs Road, T42N R5W S32SW 1/4 (MD meridian), 22 Jun 1996, *Wilson 8168* (OSC); 0.9 mi from the Gazelle Road on the Stewart Springs Road (Forest Service Road 17), at the first bend in the road, ca. 3.5 mi W and 1 mi N of Weed, T42N R5W S32SW 1/4 (MD meridian), 22 Jun 1996, *Wilson 8173* (OSC). **Sonoma Co.:** 3 mi NW of Graton, 30 May 1937, *Yates 6544* (DAV). **Tehama Co.:** Tedoc Mountain, T28N R8W S29 (MD meridian), 22 Jul 1978, *Smith & Nelson 10032* (HSC, JEPS); Tedoc Mountain, T28N R9W S29 (MD meridian), 23 Jun 1979, *Smith & Nelson 10162* (HSC). **Trinity Co.:** Morris Meadow, Stuart Fork of Trinity River, 21 Aug 1948, *Alexander & Kellogg 5526* (UC); ridge road on South Fork Mtn. ca. 10 mi N of its junction with Highway 36, 16 Jun 1972, *Anderson 5887* (HSC); South Fork Mt., along 1 SO 2, the road to Pickett Peak, 0.4 mi from its junction with Highway 36, 15 Jul 1971, *Anderson s.n.* (HSC); near Castle Rock, 25 Jun 1980, Baker 2250 (HSC); Indian Valley near Hayfork, 16 Jul 1965, *Bordon s.n.* (DAV); T30N R12W S31SW 1/4 of NW 1/4 (MD meridian), 16 Jun 1980, *Nelson & Nelson 5446* (HSC); T30N R12W S13 (MD meridian), 18 Jun 1980, *Nelson & Nelson 5544* (HSC); Red Mountain, T26N R12W S20 (MD meridian), 9 Jun 1978, *Nelson & Sawyer 4135* (HSC); Eagle Creek Campground, Shasta-Trinity National Forest, T38N R7W S16NE 1/4 (MD meridian), 15 Jun 1979, *Smith 10009* (HSC); T30N R11W S28 (MD meridian), 22 Jul 1980, *Smith 10307* (HSC); Underwood Mountain Pass, 12 Jun 1965, *Spellenberg 1104* (HSC, OSC); T25N R12W S11 (MD meridian), 28 Jun 1997, *Sprecht 1105* (HSC); Mt. Eddy, T40N R6W S12 (MD meridian), 23 Jul 1976, *Whipple 1506* (HSC).

OREGON: Douglas Co.: Beatty Creek ACEC/RNA, T30S R6W S21 and/or T30S R7W S25, 2 Jun 1994, *Brainerd & Kuykendall BLW9856* (OSC). **Jackson Co.:** Siskiyou Pass, junction old Hwy 99 w/ I-5 just N of Hilt, T41S R2E S8SE 1/4, 16 Jun 1998, *Chambers 6130* (OSC); Mount Ashland, T40S R1E S, 6 Jul 1958, *Dennis 1085* (OSC); Rogue River near Elk Creek, 9 Jun 1930, *Henderson 13344* (ORE); Dutchman's Peak, summit area, 7400 ft, 6 Aug 1961, *Hutchison 985* (JEPS); T40S R2W S7 E half of section, 23 Jun 1955, *Jeffers 61* (OSC); Lower Applegate Creek, 18 Jul 1899, *Leiberg 4096* (ORE); Grizzly Peak, 17 Jul 1913, *Peck 4470* (WILLU); Dry Summit of Mt. Ashland, 19 Jul 1913, *Peck 9307* (WILLU); Long John Creek, T40S R1W S35, *Wheeler 2987* (US); Collings Mt. near Steamboat, T40S R4W S35, 13 Jul 1950, *Whitaker 169* (WS); Observation Peak, T41S R2W S12, 14 Jul 1950, *Whitaker 271 & 248* (WS); Emigrant Creek, T40S R2E S1, 20 Aug 1949, *Whitaker 349* (WS); Deadman Pt. near Dutchman's Peak, T40S R2W S33, 13 Jul 1950, *Whitaker 222, 224, 227* (WS); Big Red Mountain (summit), T40S R1W S31, 15 Jul 1950, *Whitaker 330, 326* (WS); Ashland Peak, Siskiyou Mts., T39S R1E S34, 21 Aug 1949, *Whitaker SS355* (WS); near Canberry Campground, T41S R4W S10, 28 May 1994, *Wilson 6936* (OSC); Cantrall-Buckley County Park, 1.5 mi SW of Ruch, T38S R3W S33, 20 Jun 1996, *Wilson 8137* (OSC); Baldy Peak Trail, T40S R3W S22, 2 Jul 1996, *Wilson 8197* (OSC); South-facing slope E of the summit of Mount Ashland, T40S R1E S17, 6 Aug 1993, *Wilson, Kuykendall, Otting & Zika 6339* (OSC); Private inholding between the Klamath and Rogue River National Forests, 0.2 mi (by road) E of Siskiyou Gap and 0.4 mi (by road) W of the intersection of forest service roads 20 and 22, where the road crosses a small seep, T40S R1W S34, 6 Aug 1993, *Wilson, Kuykendall, Otting & Zika 6381* (OSC). **Josephine Co.:** Woodcock Mountain, T39S R8W S19, 20 Jun 1995, *Brock 560* (OSC); Fiddler Mountain, 11 May 1974, *Chambers 3947* (OSC); Illinois River Valley, Rockydale Rd. 2 mi. N of junction with Waldo Road, T40S R8W S15NE, 15 Jun 1998, *Chambers 6117* (OSC); Kalmiopsis Wilderness Road, T38S R8W S30, 11 Jun 1984, *Fredricks 285* (OSC); Deer Creek, 4 mi from Selma, 11 Apr 1926, *Henderson 5949* (ORE); Grayback Mountain, 13 Jul 1930, *Henderson 13339* (ORE); Eight Dollar Mountain, near Selma, Illinois River Valley, The Nature Conservancy Preserve, E base of the mountain, 11 May 1983, *Kagan 5118301-2* (OSC); 22 mi W of Gasquet Trail on O'Brien-Sourdough Road, *Kruckeberg 1861* (WS, WTU); Siskiyou N.F., junction roads 4402 & 4402-19, 4 mi SW of O'Brien, T41S R9W S4NE 1/4, 9 May 1984, *Shelly 696* (OSC); Illinois River Valley, W of Selma, 0.5 mi up Oregonite Trail from Store Gulch GS, T37S R9W S34SW 1/4 of SW1/4, 7 Jun 1969, *White & Lillico 187* (ORE); Illinois River Valley, W of Selma, hill E of Sixmile Creek, T38S R9W S2NW 1/4 of SE 1/4, 8 Jun 1969, *White & Lillico 210* (ORE); Onion Mountain Road, ca. 3 mi NW of Lookout junction, T36S R8W S4, 20 Jun 1969, *White & Lillico 289* (ORE); Hoover Gulch Trail, T38S R9W S30, 21 Jul 1969, *White & Lillico 319* (OSC); Hoover Gulch Trail, T38S R9W S30, 21 Jul 1969, *White & Lillico 322* (ORE); Whetstone Butte, T38S R9W S30, 25 Jun 1969, *White & Lillico 336* (ORE); Limestone Trail, Grayback, T40S R6W S20, 10 Jul 1950, *Whitaker 84* (WS); Murphy Creek, T29S R6W S2, 12 Jul 1950, *Whitaker 166* (WS); Josephine Mountain, T39S R9W S20, 20 Jul 1950, *Whitaker 410* (WS); No. 8 Gulch Trail, Browntown near Holland, T40S R7W S22, 11 Jul 1950, *Whitaker 119 & 136* (WS); Holland-Browntown Road, T40S R7W S4, *Whitaker 145 & 147* (WS); Sucker Creek, Grayback area, T40S R7W S12, 2 Jul 1949, *Whitaker SS83* (WS); Big Red Mountain, Ashland Area, Siskiyou Mountains, T40S R1W S32, 22 Aug 1949, *Whitaker s.n.* (WS); Sexton Mountain, T34S R6W S23, 15 May 1994, *Wilson 6834* (OSC);

Near fen on Fiddler Mountain, 1.7 mi by road from bridge over the Illinois River, 0.7 mi from Forest Service Road 4201 on a dirt road that intersects with 4201, 1 mi from (S of) the bridge, T38S R8W S30, 14 May 1994, Wilson, Camacho & Otting 6786 (OSC); Slope above and NE of Illinois River bridge, Eight Dollar Mountain, 24 May 1996, Zika 12866 (OSC).

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